भारतीय मानक

Indian Standard

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Guide for Implementation of Electrical Installation Standards in Building

ICS 91.140.50

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Safety of Electrical Installations Sectional Committee, ETD 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrical Installations Sectional Committee had been approval by the Electrotechnical Division Council.

Electrical supply and installation is an important and essential part of building services. From initial planning, design, selection of material, installation/method of construction; to testing, commissioning and maintenance; every aspect is governed by statutory provisions referring various standards and code of practices. All such standards and code are oriented to minimize risk, provide safe use, operation, functionality and convenience throughout service life. Any lapse in any of the above aspect may lead to severe effects on human life and devastation of assets. Occasions of electrical fires are increasing with the increasing use of electrical gadgets. It is very important that quality of installation is maintained at every aspects of design, selection of product, workmanship and verification.

Special installations such as high-rise buildings, hospitals, shopping complexes, hotels, large office complexes etc, where the fire hazard is high and evacuation is difficult, special conditions shall be fulfilled in electrical installation including safety services.

Statutory provisions given in *The Electricity Act*, 2003 and Safety regulations are required to be followed. In addition IS 732, IS 3043, NEC and various product standards provide the backbone for the installation and its compliance is mandatory as insisted in regulation 14 of CEA measures relating to safety and Electic Supply Regulations 2023. IS 732 — Code of practice for electrical wiring installation, is a complete and comprehensive document for electrical installation of building. This Code covers the rules for the design, erection, and verification of electrical installations. The rules are intended to provide for the safety of persons, livestock and property against dangers and damage during the reasonable use of electrical installations and to provide for the proper functioning of those installations. IS 732 applies for design, erection and verification of electrical installations such as those of:

a) Residential premises;
b) Commercial premises;
c) Public premises;
d) Industrial premises;
e) Agricultural and horticultural premises;
f) Photovoltaic systems; and
g) Low-voltage generating sets.

NOTE — 'Premises' covers the land and all facilities including buildings belonging to it.

Experience on implementation of Indian Standards and regulations in the field provides a feedback and it has been observed that standards for electrical installation are not so scrupulously followed for various reasons like, lack of knowledge, misinterpretation of some complex aspect of the standard, difficulties in finding out the various safety aspects in different standards etc. Therefore, a need was felt to prepare a document which can be understood by all, co-relates with various requirements at ground level and help to implement the standard for electrical installation. This standard can be used as a ready reckoner, a step by step guide (*see* Tables 1 and 2 with the responsibilities of different stakeholders involved in a project) for implementation of electrical installation for any building. Each step will guide the implementer to specific clause or sub-clause of IS 732, NEC and NBC document whichever is relevant.

The main advantages of following this Indian Standard are given below:

a) Any electrical contractor can accomplish acceptable installation in compliance of required rules, regulation and standard;
b) There will be similarity to the approach of electrical wiring system, regardless of type and size of building;
c) Confirmation of type of design and subsequent verification will ensure the safety and reliability of the installation; and
d) Some of the recent rules of real estate as propagated by Government of India (*RERA Act*) for the safety of buyers of the building, who may not have adequate knowledge of electrical installation, can get the confirmation of the quality of proper electrical installation and compliance of respective safety regulations by simply getting confirmation of both design and implementation through verification by third party inspection.

(*Continued on third cover*)

Indian Standard

GUIDE FOR IMPLEMENTATION OF ELECTRICAL INSTALLATION STANDARDS IN BUILDING

1 SCOPE

1.1 This Standard specifies guidance for implementation of requirements of standards for design, installation and verification of electrical installations in buildings intended to provide safety of person, livestock and property against hazards associated with reasonable use of electricity while living in it or using it. This standard covers requirements for circuits at nominal voltage up to 1 000 V a.c. or 1 500 V d.c. and frequency 50 Hz.

1.2 This standard applies to the design, erection and verification of electrical installations of:

a) Residential premises,
b) Commercial premises,
c) Public premises,
d) Industrial premises, and
e) Special locations

1.3 This standard applies to new installations and with modification of existing installations but does not apply to temporary installation.

1.4 Words Building and Premise are used in this standard concurrently meaning the same for interpretation purpose

NOTES

1 Classification of buildings covered under the scope of this standard and their co-relation with that of NBC is given in Annex J.

2 REFERENCES

The standards listed in Annex P contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purposes of this standard, in addition to the definitions given in **3** of IS 732, the following shall apply.

3.1 Builder/Developer

The individual or an agency/organisation assigned the responsibility to construct a building based on agreement with its owner. Requirement for competency shall be as per (Part 2/Sec 3) **12.9** of NBC.

3.2 Architect

The individual or an organization responsible for civil construction design of a building in compliance with relevant law/rules and regulation and has the necessary qualification and permission required for such work as defined in (Part 2/Sec 3) **12.9** of NBC.

3.3 Owner/Occupier

A person, a group of persons or a body having a legal interest in land and/or building thereon. This includes freeholders, leaseholders or those holding a sublease, who will have a legal right to occupation and have liabilities in respect of safety or building condition. In case of lease or sublease holders, as far as ownership with respect to the structure is concerned, the structure of a flat or structure on a plot belongs to the allottee/lessee till the allotment/lease subsists.

3.4 Licensed Electrical Contractor

The individual or an organization who has the required competency and registration with relevant authority to carry out electrical installation work.

3.5 Electrical Designer/Electrical Consultant

The individual or an organization responsible for planning and design of the electrical installation in the building and have necessary qualification, and experience to carry out such activity.

NOTE — For the purpose of this guide, electrical designer/electrical consultant is an electrical engineer having knowledge on the safety and technical requirements in various code of practices such as IS 732 and National Electrical Code of India 2023 and having experience and skill in electrical design.

3.6 Licensed Electrician

An individual who has the required qualification, experience and authorization from appropriate authority to work under a licensed electrical contractor to carry out the electrical installation work in a premise.

3.7 Chartered Electrical Safety Engineer

An engineer having the qualification and experience as specified by *The CEA Regulation* 6, having knowledge of *The Electricity Act*, 2003 Rules and

Regulations to assist the owner or supplier or consumer of electrical installations for the purpose of self-certification under regulation 32, 33, 38 and 45 of CEA and regulation 43 of CEA (Measures relating to *Safety and Electric Supply) Regulations*, 2023.

4 ROLES, RESPONSIBILITY, AUTHORITY AND COMPLIANCE REQUIREMENTS

4.1 Roles and responsibility in respect of electrical safety shall be applicable as per relevant statutory laws and would precede any other requirements specified in this standard. In the context of compliance of requirements of this standard, necessary roles and responsibility as given in **4.2** to **4.4** shall be applicable.

4.2 After the completion of the building and taking possession of the building, the responsibility of electrical installation and all matters related to safety and statutory obligation rest with the owner/occupier, who is in possession of the building. Quality and health of the installation need to be verified (*see* **11.3**) and required measures to be taken to address shortcomings, if any. At the time of construction of the building and before handing over, the builder/electrical contractor or the agency assigned the work for installation is responsible for ensuring compliance of all electrical requirements and handover to owner all documents required for complying these requirements.

4.3 The owner/occupier of the building is responsible for compliance of relevant rules and regulations and shall demonstrate commitment with respect to the quality of electrical installations in the building by:

a) Appointing minimum one responsible person with appropriate qualification and competency for compliance and maintenance of relevant rules;taking responsibility/accountability for the effectiveness of the quality of installation;

b) ensuring that the resources needed for maintaining the quality of installation are available;
c) engaging, directing and supporting persons to contribute to the effectiveness of the quality; and
d) promoting improvement.

NOTE — Engagement of Electrical Safety Engineer is required for multi-storey building, commercial complexes, industrial building and public building and may not be necessary for small stand-alone building. In such cases responsibility lies with the owner/occupier of the building.

A summary of requirements for compliance of design, installation and verification of electrical system in building are given Table 1 and Table 2. This summary includes reference of relevant clauses of regulation, IS 732, NEC and NBC. Additional information as standard procedure for execution of electrical work on different aspects in a project are provided in Annex A to L. It is recommended that users of this standard may first follow the requirements mentioned in this standard which would refer to corresponding clauses of IS 732 and other standards, as necessary

Table 1 Design Requirements in an Electrical Installation

(*Clause* 4.2)

ction	Activity	Stake Holder								Compliance					Check List Reference in this Standard	Guidelines - Refer Clause No.
		Owner/Developer	Architect	Civil Contractor	Other Service	Electrical Consultant	Electrical Contractor	Electrical Inspector	Electricity Supplier	CEA-Regulation	IS 732	NEC (Part/Section/ Clause)	NBC	Other Standard		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1	**DESIGN PART 1 - PRELIMINARIES**	√	√			√	√	√		√	√	√	√	√		
1.1	**Appointments, Stakeholders**	√	√			√	√			31		1/7/5			ANNEX A	**4**
1.2	**Land/Site Survey**		√			√									ANNEX B	**5**
1.2.1	clearances from existing lines OH/UG					√		√	√	60, 62, 65		1/7/ 3.3.4	8/4/ 4.7			
1.2.2	prohibition of blasting/excavation, brick kiln					√	√									
1.3	**Load Supply (Primary assessment)**	√				√				14(1, 2 and 3)		1/7/ 4.2				
1.4	**Equipment Requirement (Primary assessment)**					√					4.1.4					
1.5	**Architectural Planning, Drawings**															
1.5.1	Space requirement for major equipment and system		√			√				46(1)		1/9/4	8/4/ 4.2 to 4.5, 4.8			
1.5.1.1	location and access (DSS, Gen set, etc)									14(4)	4.1.3.12					
1.5.1.2	room (area, height, ventillation)									46(2)						
1.5.1.3	cable routes external															
1.5.2	Architectural drawings - Building construction		√			√										
1.5.2.1	Cable shafts, meter, panel room(s), etc															
2	**DESIGN PART 2 - ELECTRICAL INSTALLATION**	√	√			√	√			√	√	√				
2.1	**Internal EI**											1/7, 1/9, 1/22				
2.1.1	Layouts of light/power points and switch boards		√		√	√						1/9/5			ANNEX C	**6.2** and **6.3**
2.1.2	Distribution and SLD					√				37, 39		1/9/6				**6.2** and **6.4**
2.1.2.1	Division of circuits as per load, location, service-general/essential/critical															**6.2** and **6.5**
2.1.2.2	BBT, cabling-mains, sub-mains, final branch circuits, grouping, looping, routing					√										**6.2** and **6.6**
2.1.2.3	DBs, MCBs and other protections*		√			√										**6.2** and **6.7**
2.1.2.4	Main/sub switchboard panels - switchgears, other protections*, instrumentation		√			√										**6.2** and **6.8**
2.1.3	Protections*					√				14, 44						
2.1.3.1	Electric shock										4.2	1/10				**6.4**
2.1.3.2	Thermal effect										4.3	1/11				**6.5**
2.1.3.3	Over current										4.4	1/12				**6.6**
2.1.3.4	Voltage disturbance and EMI										4.5	1/13				**6.7**
2.1.4	Fixtures		√			√						1/9/9				**6**

2.1.4.1	Lighting, illumination															
2.1.4.2	fans															
2.1.4.3	Other															
2.1.5	Additional Considerations		√			√									ANNEX D	
2.1.5.1	Highrise buildings									38		3/22				
2.1.5.2	Hospitals, medical locations											3/9				
2.1.5.3	Hotels											3/20				
2.1.5.4	Places of public assembly/gathering											3/10, 13, 17				
2.1.5.5	Other special locations											3/1 to 22				
2.2	**External E.I.**					√										**9**
2.2.1	Street/Path Lighting											5/1, 3				
2.2.2	Garden Lighting															
2.2.3	Flood Lighting															
3	**DESIGN PART 3 - SELECTION OF WIRING TYPE AND MATERIAL**					√				√	√	√		√		
3.1	**Type of Wiring**		√			√				14(2), 39	4.1.3.7	1/7/ 4.2.6			ANNEX E	**7**
3.1.1	Situation										5.1	1/9/5				
3.1.2	External Influences											1/9/ 5.4				
3.2	**Material and Specifications**					√				14		1/9/7				
3.2.1	Cables/Wires - Conductor, Size Calculations										5.2	1/9/ 5, 7				
3.2.2	Conduits/Trunking - Fill Factor, Size															
3.2.2	BBT - Type, Material, Accessories					√										
3.2.3	Control Switchgears					√				14, 37		1/9/ 6, 7				
3.2.3.1	DBs, protections - OCPD, RCD, SPD, AFDD, etc										5.3					
3.2.3.2	Control Panels and Instrumentation					√										
3.2.4	Switches, Plug sockets and accessories		√			√				14(2), (3)		1/9/8				
3.2.5	Fixtures - Luminaries, Fans, etc					√						1/9/9				
4	**DESIGN PART 4 - Supply Source**		√	√		√		√	√	√	√	√				
4.1	**Design Load**	√	√	√		√	√		√		4.1.5.6.1	1/9/6			ANNEX F	
4.2	**LT Supply**					√										
4.2.1	Meter Room - Location, Design, Layout		√	√					√			1/9/ 4.4, 4.5				
4.2.2	Type of system earthing		√								4.1.5.8.2					
4.1.3	Supplier's Side					√			√							
4.1.3.1	Service cable, feeder pillar, routing, space									15						
4.1.3.2	Equipment - control, distribution, meter, etc									16						
4.1.3.3	Earth terminal									18						
4.1.4	Consumer's Side					√										
4.1.4.1	Control, protection, cable/mains, routing, etc									37(2)						
4.1.5	Standby supply					√										
4.1.5.1	Gen set(s) - capacity design, distribution		√							14		2/1				
4.1.5.2	UPS/Inverter - capacity design, distribution					√										
4.3	**HT Supply**		√			√			√							

4.3.1	Transformer(s)									46		2/2				
4.3.2	Infrastructure - supplier															
4.3.2.1	in coming line, Isolation/RMU, metering															
4.2.4	Infrastructure - Owner		√			√			√	37, 46						
4.2.4.1	Isolation/HT panel															
4.2.4.2	Transformer(s) - capacity design									14						
4.2.4.3	LT control and distribution panel									37		1/9				
4.2.4.4	Cable distribution network - size, route, etc					√				14	5.2					
4.2.5	Civil Infrastructure - Room, Duct, etc		√			√							8/4			
5	**DESIGN PART 5 - EARTHING**		√	√		√		√	√	√	√					
5.1	**Type of System Earthing**									43	4.1.5.8				ANNEX G	
5.2	**Main Protective Equipotential Bonding**									43	4.2					
5.2.1	Locations/Convenience for Verification		√								5.4					
5.2.2	Main Earthing Terminal				√	√	√				5.4					
5.2.3	Disconnection Time at Every Location										Table 1					
5.2.4	Protective Conductor - Specifications										5.4					
5.3	**Foundation/in RCC Earthing - Special Considerations**		√								5.4					
6	**DESIGN PART 6 - Lightning Protection**		√		√	√		√			√	√	√			
6.1	**LPS Need - Risk Assessment**					√	√	√				1/19	8/11.3	IS / IEC 62305 1 to 4	ANNEX G	
6.1.1	Selection - External/Internal, Air Terminations, Down Conductor(s) - Natural Conductor/in RCC		√										8/11.5 11.6			
6.1.2	Type of Earthing (A/B) (foundation/in RCC)			√												
6.1.3	Materials, Sizing, Routing															
7	**DESIGN PART 7 - FIRE PREVENTION AND LIFE SAFETY**		√	√		√		√		√	√	√				
7.1	**Civil Infrastructure - Rooms, Shafts, etc**		√			√	√	√				1/9/ 4.5				
7.2	**Electrical Installation**					√	√	√								
7.2.1	General, Material					√	√	√		14(1)		1/9/5				
7.2.2	Transformer(s)					√	√	√		46						
7.3	**Classification of Building Under Utilisation Category**		√			√		√			Table 7	1/11				
7.3.1	Special Requirements for Safety Service		√			√	√	√		29	5.6					
8	**DESIGN PART 8 - SAFETY FOR SPECIAL INSTALLATIONS**		√			√		√		√				√		
8.1	**EV Charging**					√				123 to 128						
8.2	**Prosumer Installation (IEC 60364-8-2)**					√								√		
8.3	**Solar PV (IS 16997)**					√								√		
9	**DESIGN PART 9 - Energy Efficiency (IS 16996)**		√			√								√		
9.1	**Barycentre Method**		√			√								6.3		
9.2	**Losses in Eiring - Conductor, PF, Harmonics, etc**					√								6.7		
9.3	**Determination of Zones, Usages and Meshes**		√			√								7		
9.4	**Energy Efficiency and Load Management System**					√								8		

Table 2 Verification Requirements in an Electrical Installation

(*Clause* 4.2)

Section	Activity	Stake Holder								Compliance			Check List Reference in this Standard	Guidelines Clause No.
		Owner/ Developer	Architect	Civil contractor	Electrical Consultant	Electrical Contractor	Chartered electrical Safety	Electrical Inspector	Electricity Supplier	CEA - Regulation	IS 732	NEC		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(14)	(17)	(18)
1	**VERIFICATION PART 1**									√	√	√		
1.1	**Appointment of Chartered Electrical Safety Engineer**	√			√	√	√			6				
1.2	**Design Document Verification**				√	√	√				6.2.2.2			
1.3	**Check Compilance to Standards and Regulations**				√	√	√					P1S17		
2	**VERIFICATION PART 2**									√	√	√		
2.1	**Work Completion**				√	√	√	√	√		6.2.1	P1S17		
2.1.1	Confirming Physical Completion				√	√								
2.1.2	Initial Verification					√	√							
2.1.2.1	Visual inspection					√	√				6.2.2.3			**11.5**
2.1.2.2	Documentation - Equipment, material				√			√			6.2.4			**11.4**
2.1.2.3	Testing with supply OFF									33, 35, 42, 43	6.2.3.1 a to d			**11.6**
2.1.2.4	Testing with supply ON									33	6.2.3.1 e to j			
2.1.2.5	Documentation							√			6.2.4			**11.4**
2.1.2.6	Report							√	√		6.2.4			**11.4**
2.1.3	Statutory Compliance	√					√	√						
2.1.3.1	Permission from electrical inspector	√					√	√						
2.1.3.1.1	Gen-set									34				
2.1.3.1.2	Highrise								√	38				
2.1.3.1.3	HT installation									45				
2.1.4	Commissioning				√	√		√	√					
2.1.4.1	Test Report to Supply Co.								√	33, 35				
2.1.4.2	Release of supply									31(2), 35				
2.1.4.3	Satisfactory Working	√			√	√								
2.1.5	Handing Over	√				√								
2.1.5.1	Documents to consumer/user	√				√	√				6.2.4	P1S17		**11.4**
3	**VERIFICATION PART 2**									√	√	√		
3.1	**Post Completion Mandates**	√					√	√						
3.1.1	Maintenance Schedule	√									6.3	P1S17		**11.4**
3.1.2	Periodical Verification						√			32				
3.1.3	Documentation													
3.1.4	Reporting to Electrical Inspector							√						

5 ARCHITECTURE/CIVIL PLANNING AND DESIGN

5.1 Depending upon the complexity of the project, planning process to be initiated and shall include involvement of Certified Electrical Contractor/ Consultant. This activity shall include plan for the selection of site, assessment of suitability of the site from electrical installation point of view (like overhead transmission line, railway crossing, etc). Checklist of project planning given in Annex B shall be followed.

5.2 Health and life of an old installation in building need to be assessed and follow up action to be taken to augment the requirements or replacement of installation that are identified as necessary. Statutory provision for verification at a frequency of once in five years is specified for certain category of premises. For the purpose of this standard a safety audit at a frequency as per Annex K is recommended.

5.3 When planning for electrical installation system, the owner/developer shall consider and determine the risks that need to be addressed to prevent or reduce undesired effects on electrical safety and take actions to address these risks.

5.4 Architectural Planning Requirements

5.4.1 At planning stage, the architect of the building shall consult with electrical consultant/contractor to take into account the requirements of applicable regulation/standards in respect of site and location (*see* Note below) of construction and in respect of drawings of building, requirement of spaces, clearances, approach ways, raceways, shafts, recommended wall thickness, required provisions for prevention from fire hazard likely to originate from electrical installation.

NOTE — If proposed construction is within vicinity of existing overhead line/underground cable compliance with regulation 65 of CEA Safety Regulations, 2023 shall be checked prior to commencement of any work on site. Minimum clearance required for gas pipeline (except gas line connected to buildings) is 3 m.

5.4.2 Architect shall incorporate following provisions in the drawings related to services as per the applicable requirements.

a) Site plan — Site plan shall show existing overhead electrical lines/underground cables if any and proposed construction within the boundaries of the area to be developed.

b) Routes and service entry points — Architectural drawings shall clearly mark electrical service entry points, cable routes below ground, through the building structure, so that detailing in electrical shop drawings will restrict the work within specified route and no conflict shall occur with other building utility service. The drawings shall specify required horizontal and vertical clearance to be maintained between other utility services.

5.5 Fire Safety

Fire safety requirement shall comply with Part 4 of NBC and relevant clauses of Central Electricity Authority (measures relating to safety and electric supply) Regulations, 2023. Table for selection of electrical requirement of buildings based on conditions of evacuation as per Table 7 of IS 732 and type of building occupancy as per Table 7, Part 4 (fire and life safety) of NBC of India 2016 is provided in Annex J.

5.5.1 *Fire Rating*

The electrical panel rooms, doors, segregation arrangement within shaft shall have fire rating of 2 h or as per requirements mentioned under NBC, Central Electricity Authority (*Measures relating to safety and electric supply*) *Regulations,* 2023.

5.5.2 *Shafts/Ducts/Chambers*

Design and location of cable ducts, shafts, chambers, their covers and entry points, shall be as per shop drawings provided by electrical designer/electrical consultant (*see* **6**) and shall be in consultation with; considering further aspects of maintenance/repairs/ replacement. Size of chambers shall be in consideration with bending radii of cables. At every floor level, there shall be a provision to seal these shafts, so that in case of fire, it shall not spread or smoke shall not pass from one floor to other.

6 ELECTRICAL DESIGN AND DEVELOPMENT

6.1 Electrical Provisions

Requirements given in the following clauses shall be followed. A checklist for design and erection given in Annex A to H should be followed.

6.1.1 *Statutory Obligations — Appointment of Licensed Electrical Contractor*

Reg. 31 (1) (precautions to be adopted by consumers, owners, occupiers, electrical contractors, electrical workmen and suppliers) shall be followed by the owner/developer and work shall be carried out through Licensed Electrical Contractor who shall be responsible to do the work through the qualified/certified workmen having required permit in that regard. He shall also see that the material to be used, work and workmanship shall conform to respective standards and regulations and shall submit test report of the work carried-out by him.

NOTE — All work hidden inside the building shall be checked for conformity with respect to the requirements of the standards prior to getting it concealed and the same shall be certified by the contractor and verified by the chartered electrical safety engineer.

6.1.2 *Statutory Obligations — Approvals/ Permissions/Licenses*

Required approvals shall be taken as per related Rules and Regulations mentioned below prior to the commissioning and handing over the installation for beneficial use.

a) Central Electricity Authority (measures related to safety and electric supply) Regulations 2023 including all amendments.
b) Reg. 34 — Generator: Inspection and approval for commissioning.
c) Reg. 38 — Multi-storied building (height above 15m): inspection and NOC for commencement of supply.
d) Reg. 45 — Transformer sub-station or any installation above 650V: inspection and approval before commencement of supply.
e) Relevant Lift and escalator Rules.
f) Rule 5 — License for working of Lift and escalator.
g) Approval from the concerned fire and safety department.
h) Any other statutory approvals from local body/government/energy supplier

NOTE — Compliance to National Electrical Code of India 2023, national Building Code of India 2016 and other IS standards are mandatory to fulfil the requirements of the regulation mentioned in a).

6.2 Layout and Planning of Electrical Installation

Layout and planning of electrical installation as specified below shall be conducted by licensed electrical contractor/electrical consultant. Close consultation/coordination shall be carried out with building architect for making provision as per requirement envisaged.

6.2.1 *Locations of Electrical Panels*

Locations and position for main and sub electrical panels shall be marked in building plan and adequate space/room shall be allocated considering size of panel, clearance in front, side and back. Consideration shall be given to space required for opening of the panel doors/racking out breakers, and approach boundaries and accessibility. Floor mounting panels may preferably be located in separate electrical panel rooms, having outside door opening, required fire rating (minimum two hours) and ventilation arrangement.

6.2.2 *Electrical Meter Rooms*

Meter rooms may be separate. It shall be planned to have sufficient head room and clear space in front of metres, control switches (at least 1 m). Space on wall shall be sufficient to accommodate required number of meters at such height that readings can be taken without aid of any tackle. Also the switchgears shall be at least 0.5 m above floor level and within such height to have an easy access for operation. The meter room shall be well ventilated, protected from external influences like sun, rain, water seepages, flood water, entry of rodents. Location of meter room shall be suitably adjacent or nearest to cable duct/shaft/vertical route of mains.

NOTE — Meter rooms shall not be located below staircases where above requirements could not be complied with.

6.2.3 *Movement of Heavy/Bulky Electrical Equipment*

For installation of electrical equipment within building which is likely to be heavy/bulky in size or removing it for maintenance, provision of adequate passages, stairways or any alternate provision for its shifting/movement shall be taken into account.

6.2.4 *Shafts/Ducts*

There shall be provision of shafts with required fire rating (2 h if not mentioned specifically) for vertical electrical distribution which may preferably be adjacent to electrical panels. Shafts shall be separate for electrical HT cables, LT power cables/bus-bar trunking and cable work of extra low voltage systems like telephones, security system, fire alarm, signaling, BMS or data networking etc. If independent shaft is not possible, there shall be an arrangement for segregation in between, with required fire rating same as that of shaft. No other utility service shall run through these shafts. Shafts shall be accessible at all levels with doors having fire rating as that of shaft and shall not open in fire escape staircase. All shafts shall have fire prevention provision as per national building code and fire safety requirements of local statutory authorities.

NOTE — As per CEA Reg. 38 provision in respect of independent electrical service shaft is mandatory for all buildings above 15 m height (high-rise buildings).

6.2.5 *Openings and Covers*

Manholes/opening of chambers shall not be less than 650 mm × 550 mm or 650 mm in diameter, where opening is intended for entry of person. Covers of manholes, chambers shall bear sufficient strength to withstand loads likely to be imposed on the structure. Covers shall be marked with the name of the service. Openings/Covers of junction boxes/draw-in boxes/accessories in conduit systems with inspection openings shall always be accessible.

6.2.6 *Enclosures for Underground Cables*

Pipes to be used for cable as enclosures shall be of required diameter so that cable can pass through or removed from easily and have sufficient mechanical strength and shall be erected at required depth to suite requirements of IS 1255. While selecting the size of cable enclosure appropriate space factor shall be applied.

6.2.7 *Wall Thickness*

Walls shall be of sufficient thickness to accommodate concealed boxes/switch boards/distribution boxes so that installation of boxes will not affect strength of wall. Additional strengthening shall be considered if necessary.

NOTES

1 Depth of box may be 60 mm or vary depending on manufacturer's design. Under circumstances in 100 mm wall it is not possible to accommodate these boxes back to back. Staggering may solve problem to certain extent.

2 Electrical installation in building may not be concealed always and it is left to the preference of user.

6.2.8 *Structural Strength*

In wiring installation where cable ladder, tray system is used for cable management, its structure along with the load of cables which it is going to support, is likely to impose load on the primary structure of building. This situation occurs when supports of this system are fixed on building structure. For this building structure shall have capacity to bear the load. At some locations there are chances of conduits getting crowded endangering structural strength due to number of circuits entering/passing out from the particular DB/panel. This situation may occur in beam, slab, and wall. If such situation is unavoidable necessary measures may be required to retain structural strength.

6.2.9 *Sleeves/Core Cutting*

As far as possible sleeves shall be got erected for entry of wires/cables through wall, flooring, RCC structure during construction to avoid core cutting, damages and reworking at finishing stage. Sometimes core cuttings may be required which shall be done with the consent of structural engineer and under supervision of civil engineer.

6.2.10 *Water Leakages/Seepages*

Design shall take into consideration possible seepages, leakages, accumulation, and ground in-surge of water, which is hazardous to electrical installation. Location of electrical installation/duct should be separate and away from installation related to water supply/gas supply system. Wherever necessary, required provisions shall be made at such locations to segregate the installation and work shall be executed with due care.

6.2.11 *Bathrooms/Washrooms*

Within bathrooms/washrooms, location of showers, faucets shall comply Part 3 (Section 2 and 3) of NEC.

6.2.12 *Tandems in Flat Slab Post Tension Structures*

For flat slab post tension structures locations of tandems marking shall be made to avoid puncture of/damage to tandems during electrical construction activity.

6.2.13 *Earthing*

Any construction work, including excavation, subsequent to construction of earthing electrode/s; shall not disturb/damage any part of earthing system. Any civil work on construction site shall not cause cover-up/concealing of any portion of electrical earthing system without notice and consent of person In-charge of electrical work.

6.2.14 *Sub Stations/Generators/Batteries*

Trenches, ventilation, approach roads shall be provided as per necessity.

6.3 Electrical Design

6.3.1 While designing the electrical installation, the following basic information shall be considered and selected appropriately keeping safety as the primary objective:

a) An assessment of general characteristics of power supply;
b) External influences which it is to be exposed (*see* Table 7 of IS 732);
c) Compatibility of its equipment and characteristics;
d) Maintainability;
e) Safety service; and
f) Continuity of service.

6.3.2 *Assessment of General Characteristics of Power Supply Includes Conductor Arrangement and System Earthing*

For system earthing, **4.1** and **5.4** of IS 732 shall be followed. Following points shall be considered for an easy selection:

a) System earthing is divided into TN/TT and IT systems, out of which TN and TT are solidly earthed system and IT is unearthed or earthed through a high impedance. Clause **5** of IS 3043 provides more clarity on choice of earthed or unearthed system,

b) TN system require a metallic low impedance fault return path from the installation to the source, whereas TT system use electrically independent earth electrodes at installation and source,

c) For public electricity distribution the commonly used system is TN-C-S with PME (*see* **4** of IS 3043 statutory provisions for earthing for more information),

d) Industrial system, at voltages higher than 250 volt and up to 650 volts should be designed as a PME system with separate protective conductor. (TN-S system). (*see* **27** of IS 3043),

e) In all cases:

   1) The earth fault loop impedance has to be low enough to allow adequate earth fault current flow to cause an overcurrent protective device (for example, a fuse or circuit breaker) in the faulty circuit to operate in a sufficiently short time; or

   2) Where it is not possible to achieve a low enough earth fault loop impedance, disconnection may be initiated by fitting a residual current device (RCD) of 30 mA rating as specified in IS 732.

f) Fault protection with an RCD of not more than 30 mA at origin of installation is necessary for a TT system.

6.3.3 An assessment of following characteristics of equipment shall be made which is likely to have harmful effects upon other electrical equipment or other services or likely to impair the supply:

a) Transient over voltages;
b) Undervoltage;
c) Unbalanced loads;
d) Rapidly fluctuating loads;
e) Starting currents;
f) Harmonic currents;
g) D.C. feedback;
h) High-frequency oscillations;
j) Earth leakage currents;
k) Necessity for additional connections to earth; and
m) Excessive conductor currents not due to a fault.

6.3.4 Need for continuity of service shall be assessed for each circuit.

For detailed information on considerations of design **4.1.5.5** to **4.1.5.15** of IS 732 shall be referred.

6.4 Protection against Electric Shock

6.4.1 Protection against electric shock is achieved by implementing various measures as per **4.2** of IS 732**.** Protective measure shall consist of:

a) An appropriate combination of a provision for basic protection and an independent provision for fault protection, or
b) An enhanced protective provision which provides both basic protection and fault protection.

The adopted protective measures shall confirm **4.2** of IS 732. In addition, the following shall comply:

6.4.1.1 RCDs used for AC applications, shall be selected based on the type of expected residual current wave shape. These types are known as type AC, type A, type F and type B. All these devices are intended to be used on AC supply systems.

a) Type AC are used for general purposes applications;

b) Type A shall be used in cases where the application may create pulsating DC residual current. (for example, single phase class 1 devices with rectifying circuit like cooking plates/supply to an electric vehicle charging station (mode 1 or 2) as per IS17017-1);

c) Type F shall be used in the cases where the application may create composite residual current. (for example, single phase class 1 devices containing a motor controlled by a variable speed drive such as a heat pump or air conditioner); and

d) Type B shall be used in cases where the application may create smooth DC residual current. (for example, three-phase class 1 devices containing a motor controlled by a three phase variable speed drive such as certain types of three phase air conditioner, or pumps, or supply to an electric vehicle charging station (mode 3) as per IS 17017-1).

6.5 Protection against Thermal Effect

6.5.1 Protection against thermal effect (fire caused by electrical equipment, locations where risks of fire exist, protection against burns and protection against overheating) shall confirm to **4.3**

of IS 732, (*see* Table 7, code B; utilization and code C; construction of building).

6.5.2 In addition, it is recommended that special measures be taken to protect against the effects of arc faults in final circuits. AFDD with should be placed at the origin of the circuit to be protected.

a) In premises with sleeping accommodation;
b) In locations with risks of fire due to the nature of processed or stored materials, that is, BE2 locations, (for example, barns, wood-working shops, stores of combustible materials);
c) In locations with combustible constructional materials, that is, CA2 locations (for example, wooden buildings);
d) In fire propagating structures, that is, CB2 locations;
e) In locations with endangering of irreplaceable goods.

NOTE — Refer Table **7** of IS 732, Code B; utilization and code C; construction of building for information about various classifications such as BE2, CA2, CB2 etc.

6.6 Protection against Overcurrent

Protection against over current shall confirm **4.4** of IS 732.

6.7 Protection against Voltage Disturbance and Electromagnetic Disturbance

Protection against voltage disturbances and electromagnetic disturbance shall confirm to **4.5** of IS 732.

6.7.1 Electrical system shall be designed in such as a way that

a) Temporary over voltages due to earth faults in the high-voltage system and due to faults in the low voltage system shall be limited as per **4.5.2** of IS 732.
b) Lightning protection shall confirm to IS/IEC 62305 and National Building Code of India. Risk assessment shall be carried out as per IS/IEC 62305-2 and suitable protective measures selected as per IS/IEC 62305-3 and IS/IEC 62305-4. Coordination between architect, civil, structural and electrical designers are necessary to carry out foundation earthing or using natural components as parts of lightning protection system.
c) Suitable protective devices as per **5.3.5** of IS 732 are installed in order to ensure that the over voltages of atmospheric origin or due to switching are limited to a level lesser than the over voltage category of the equipment.
d) Measures for reducing the electric and magnetic influences on electrical equipment shall be a part of design, installation and verification. Electrical equipment, which meets the EMC requirements of the relevant product standard shall be used.
e) UPS of inverters used in the installation shall have suitable measures in built to protect against back feeding of power to the source. Single phase UPS or inverters used, shall isolate line and neutral conductor in order to ensure this safety [*see* **6.5.7** of NEC (Part 1/Section 9].
f) A common entry point shall be preferred for all metallic services entering into the building.
g) Drop in voltage, or a loss and subsequent restoration of voltage could not create any dangerous situations for persons or property.
h) It shall be ensured that there is no common neutral or looping of neutral of different circuits on the consumers' side. Each circuit shall have its own neutral conductor

7 SELECTION AND INSTALLATION OF EQUIPMENT

7.1 Every equipment shall comply with relevant Indian Standard wherever available. In the absence of the relevant Indian Standard, IEC standards may be used, or special agreements can be made between developer/electrical contractor and user. Selection of the equipment shall confirm **5** of IS 732. Consideration shall be given to the following points from the respective clause of IS 732 and shall conform to provisions of National Electrical Code (NEC).

a) Operational conditions such as voltage, current, frequency, power and compatibility.
b) External influences selected as per Table 7 in IS 732.
c) All equipment, including wiring, shall be accessible for its operation, inspection and maintenance.
d) Labels or other suitable means of identification shall be provided to indicate the purpose of switchgear and control gear, unless there is no possibility of confusion. (for example, a single line diagram of the

installation shall be made available for ready reference and in the case of large installations it shall be exhibited in the electrical room)

e) Wiring shall be so arranged or marked that it can be identified for inspection, testing, repairs or alteration of the installation.

f) The identification of separate neutral and protective conductors as per IEC 60445.

g) The protective devices shall be arranged and identified so that the circuits protected may be easily recognized.

h) Diagrams, charts or tables shall be provided in accordance with IEC 81346-1 and the IEC 61082 indicating the type and composition of circuits and the characteristics necessary for the identification of the devices. The symbols used shall be confirm IS 12032.

j) Equipment shall be so selected and erected considering electromagnetic influences and harmful influence between the electrical installation and any non-electrical installations are avoided.

k) Circuits operating at different voltages shall be effectively segregated wherever necessary to avoid mutual detrimental influence.

m) Protective conductor current shall be restricted within the limits prescribed in Annex Q of IS 732.

7.2 Selection and Installation of wiring systems shall confirm **5.2** of IS 732. Wires with class 2 copper conductors shall be used as protective conductors, including protective bonding conductors and live conductors in final circuits. Copper wire shall be used for wiring cross section area at least upto 16 sq mm.

7.3 Devices for Protection against Thermal Effects and Fire

7.3.1 Devices shall be mounted so as to allow, safe dissipation of heat or arcs/sparks which could cause harmful thermal effects. Protective devices shall be installed as close as practically possible to the origin of the circuit to be protected.

7.3.2 In locations with a particular risk of fire exist (*see* Annex J), devices used for protection against thermal effects shall not be provided with automatic re-closure.

7.3.3 With the exception of devices to facilitate evacuation, switchgear and control gear devices in locations with external influences BD2, BD3 or BD4 shall be accessible only to authorized persons. Where installed in passages, switchgear and control gear devices shall be placed within enclosures complying with IEC 60670-24, IS/IEC 61439-2, IS/IEC 61439-3 or IEC 62208.

7.3.4 Switchgear for protection, control or isolation in locations with external influences BE2 shall be placed outside location BE2, unless it is in an enclosure providing a degree of protection appropriate for such a location of at least IP4X, or IP5X in the presence of dust, or IP6X in the presence of conductive dust.

7.3.5 Unless specifically designed to be inherently heat-limiting, in all operational modes, motors shall be protected against excessive temperature by a motor protective device with manual reset.

7.3.6 RCD and RCM for protection against thermal effects and fire, shall confirm with **4.3.2.3.9** of IS 732.

7.3.7 Where an IMD is selected for preventing the risk of fire the response value shall not be lower than 100 Ω/V except in a public distribution system with a galvanic supply, the value shall not be lower than 40 Ω/V; or 50 percent of the insulation resistance without insulation failure and full load.

7.3.8 AFDD used for the protection against arc faults shall comply with IS 17121.

7.4 Protection against over voltages of atmospheric origin and switching shall be achieved by installing SPD’s as per **5.3** of IS 732.

7.5 Protective equipotential bonding shall be implemented as a mandatory safety requirement as per **4.2.11.3.1.2** and **4.2.15.2** of IS 732.

7.6 Where functional earthing and functional-equipotential-bonding system is not locally connected to the protective equipotential bonding system, the functional bonding conductors shall be insulated, and installed separately from the protective conductor, and connected to the main earthing terminal only once.

7.7 Earth electrodes which may be used in an installation are concrete-embedded foundation earth electrode, soil-embedded foundation earth electrode, metallic electrode embedded directly in soil vertically or horizontally (for example, rods, wires, tapes, pipes or plates), welded metal reinforcement of concrete (except pre-stressed concrete) embedded in the earth.

7.7.1 When selecting the type and depth of an earth electrode, consideration shall be given to possible mechanical damage and to local conditions to minimize the effect of soil drying and freezing.

7.7.2 Consideration shall be given to electrolytic corrosion when using different materials in an earthing arrangement. For external conductors (for example, earthing conductor) connected to a concrete embedded foundation earth electrode, the connection made from hot-dip galvanized steel shall not be embedded in the soil.

7.7.3 The earthing arrangement shall not rely on a metallic pipe for flammable liquids or gases as the earth electrode and their buried length shall not be considered when dimensioning the earth electrode. However protective equipotential bonding is necessary.

7.7.4 Where an earth electrode consists of parts that must be connected together, the connection shall be by exothermic welding, pressure connectors, clamps or other suitable mechanical connectors. Connections made by a wrapped iron wire only are not suitable for protection purposes.

7.8 Auxiliary circuits used for transmission of signals intended for control, detection, supervision or measurement of the functional status of a main circuit shall satisfy the requirements of **557** of IEC 60364-5-55.

7.9 Transformer Sub-Station

Transformer sub-station providing supply to the building if located within building shall use dry type transformer.

7.10 Generator Standby Supply

For every high-rise building there must be a provision of generator supply as a standby arrangement which shall be of adequate capacity to cater load of all emergency systems for required time. Location and system of supply shall be such that functioning, and purpose of generator will not be affected due to emergency like fire in building. If fire authority requires standby supply arrangement for fire-fighting system also, provision of generators shall be made accordingly [*see* NEC (Part 2/Section 1)].

8 Safety Services

Safety Services shall be selected and erected as per **5.6** of IS 732. In addition, the following shall comply:

8.1 One or more electrical sources for safety services shall be provided to maintain supply for adequate duration. Preferential circuits and all equipment of safety services shall be provided, either by construction or by erection, with fire protection to ensure normal operation, in fire conditions, for adequate duration.

8.2 Circuits of safety services shall not be protected by RCDs or AFDDs.

8.3 The higher resistance of conductors due to high temperature when exposed to fire shall be taken into account when sizing the conductor cross-sectional area. Fire survival cable as per relevant Indian standard shall be used for connection to all essential services including signaling and communication for fire services.

8.4 The wiring systems of safety services should be segregated from other services other than metallic screened fire-resistant cables and installed in such a manner that the safety services are not affected by any fault occurring on non-safety services and mitigate the effects of a fire.

8.5 Switching facility may be provided to prevent discharging of the electrical storage source for safety services when the building is not occupied.

8.6 Each single-phase circuit shall have its own neutral conductor. A common neutral for more than one circuit is not permitted.

8.7 If a fire switch is required, conductors supplying fire protection equipment whose operation is necessary during a fire, shall be connected at the power supply side of the fire switch. It shall be clearly identified.

9 SPECIAL INSTALLATION

Following special installations/locations require additional safety measures. Additional safety measures shall confirm to requirements specified in Part 3 of National Electrical Code of India:

a) Bath or shower;
b) Swimming pools and fountains;
c) Rooms and cabins containing sauna heaters;
d) Construction and demolition sites;
e) Agricultural and horticultural premises;
f) Conducting locations with restricted movement;
g) Caravan parks, camping parks and similar locations;
h) Marine and similar location;
j) Medical locations;
k) Exhibitions, shows and stands;
m) Solar photovoltaic (PV) power supply systems;
n) Furniture;
p) External lighting installations;
q) Extra low voltage lighting installation;

r) Mobile or transportable units;
s) Recreational, assembly buildings and workplace;
t) Electrical installation in caravan and motor caravan;
u) Supplies for electrical vehicles;
v) Operating or maintenance gangway;
w) Temporary electrical installations for amusement devices and booths at fairgrounds, amusement parks and circuses; and
y) Heating cables and embedded heating systems

10 ENERGY EFFICIENCY REQUIREMENT

Electrical installation may be designed and installed confirming the energy efficiency requirements as per IS 16996 and NEC (Part 1/Section 22).

11 VERIFICATION (INSPECTION AND TESTING)

Verification (inspection and testing) of a low voltage electrical installation shall be conducted as per **6** of IS 732 for installations up to 1 000 V a.c. and 1 500 V d.c.. For voltages above 1 000 V a.c. or 1 500 V d.c. and special installation/locations, verification shall be conducted as per **4.2.1** of Part 1, Section 17 of national electrical code of India. Check list of verification given in Annex H should be followed with supporting document.

11.1 Initial Verification

Every installation must be verified during erection and before handing over to the user. In case of addition or modifications of existing installation, full scope of tests shall be performed. Verification shall be carried out by an independent third party other than designer and contractor.

11.2 Periodic Verification

Periodic verification is also necessary to ensure that the installation and its components are in a good condition to operate safely. Recommended frequency of periodic verification shall be as per Annex K.

NOTE — Periodic verification in leased/rented building is subject to agreement between old and new owner/occupier (*see* **5.2**).

11.3 Test Result

Test results of every circuit shall be recorded on the formats as recommended in Annex H. The results shall be compared with the required data. Non-conformities shall be rectified by the developer/contractor and retested before issuing the certificate.

11.4 Inspection of LV System.

Inspection shall include checking of the following, where relevant. The relevant clause of IS 732 is provided along with each inspection requirement.

a) Method of protection against electric shock (*see* **4.2**);

b) Presence of fire barriers and other precautions against propagation of fire and protection against thermal effects (*see* **4.3** and **5.2.10**);

c) Selection of conductors for current-carrying capacity (*see* **4.4**, **5.2.6** and **5.2.8**);

d) Single-pole switching devices connected in the line conductors (*see* **5.3.7**);

e) Choice, setting, selectivity and coordination of protective and monitoring devices (*see* **5.3.7**);

f) Selection, location and installation of suitable overvoltage protective devices where specified (*see* **5.3.5**);

g) Selection, location and installation of suitable isolating and switching devices (*see* **5.3.6**);

h) Selection of equipment and protective measures appropriate to external influences and mechanical stresses (*see* **4.3.2**, **5.1.2.2** and **5.2.5**);

j) Identification of neutral and protective conductors (*see* **5.1.4.3**);

k) Presence of diagrams, warning notices or similar information (*see* **5.1.4.5**);

m) Identification of circuits, overcurrent protective devices, switches, terminals etc (*see* **5.1.4**);

n) Adequacy of termination and connection of cables and conductors (*see* **5.2.9**);

p) Selection and installation of earthing arrangements, protective conductors and their connections (*see* **5.4**);

q) Accessibility of equipment for convenience of operation, identification and maintenance (*see* **5.1.3** and **5.1.4**);

r) Measures against electromagnetic disturbances (*see* **4.5.4**);

s) Exposed-conductive-parts are connected to the earthing arrangement (*see* **4.2.11**);

t) Selection and erection of the wiring systems (*see* **5.2.4** and **5.2.5**); and

u) Particular requirements for special installations or locations (*see* Part 3 of NEC).

11.5 Tests and its Sequence of LV System

It is important to keep the sequence of testing as follows. In case of failure in a test, retesting from the previous test onwards after rectification is necessary. Testing in potentially explosive atmosphere require appropriate safety precautions in accordance with IS/IEC 60079-17.

a) Resistance of conductors (*see* **6.2.3.2**);
b) Insulation resistance of the electrical installation (*see* **6.2.3.3**);
c) Protection by SELV, PELV or by electrical separation (*see* **6.2.3.4**);
d) Floor and wall resistance/impedance (*see* **6.2.3.5**);
e) Automatic disconnection of supply (*see* **6.2.3.6**);
f) Additional protection (*see* **6.2.3.7**);
g) Polarity test (*see* **6.2.3.8**);
h) Test of the order of the phases (*see* **6.2.3.9**);
i) Functional and operational tests (*see* **6.2.3.10**);
j) Voltage drop (*see* **6.2.3.11**); and
k) Additional tests for special locations (*see* Part 3 of National Electrical Code of India).

12 INSTRUMENTS REQUIRED FOR TESTING

Instruments used for testing shall be chosen as per IEC 61557. The test instrument can be a stand-alone meter or a meter with multiple testing facilities. The meters shall be calibrated as per the standards requirement. Following meters are required to carry out testing of an LV installation.

12.1 For general safety testing meters capable of testing the following parameters are necessary:

a) Insulation resistance tester/meter;
b) Loop impedance meter;
c) Continuity resistance meter (micro-ohm meter with test current at least 10 A);
d) Earth resistance meter (earth electrode resistance testing);
e) RCD tester;
f) Phase sequence tester; and
g) Insulation fault location meter and meter to test effectiveness of residual current monitoring for IT system.

12.2 For an advanced/detailed study meters to measure the additional features are necessary. These metres and the measurements shall confirm IEC 61557-12.

a) Active power (P) and active energy (E_a);
b) Reactive power (Q_A, Q_V) and reactive energy (E_{rA}, E_{rV});
c) Apparent power (S_A, S_V) and apparent energy (E_{apA}, E_{apV});
d) Frequency (f);
e) RMS phase current (I) and neutral current (I_N, I_{Nc});
f) RMS voltage (U) measurements;
g) Power factor (PF_A, PF_V);
h) Short term flicker (P_{st}) and long term flicker (P_{lt});
j) Voltage dip (U_{dip}) and voltage swell (U_{swl});
k) Voltage interruption (U_{int});
m) Transient overvoltage (U_{tr}) measurements;
n) Voltage unbalance (U_{nb}, U_{nba});
p) Voltage harmonics (U_h) and voltage THD (THD_u and $THD\text{-}R_u$);
q) Current unbalance (I_{nb}, I_{nba});
r) Current harmonics (I_h) and current THD (THD_i and $THD\text{-}R_i$); and
s) Minimum, maximum, peak, three-phases average and demand.

13 REPORTING OF VERIFICATION

Reporting of results shall be done as per Annex H.

14 HANDING OVER DOCUMENTS

Completed verification report shall be the part of obligation to handover all the relevant documents to the prospective owner for his information and record. Check list of minimum handing over documents required for the compliance of electrical requirements in a building as per *RERA Act*, 2016 is provided in Annex M and N.

ANNEX A

(*Clause* 4.3)

(Informative)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK

Check List No. 1					
Design Part 1 - 1.1 Preliminaries					
Ref.	**Reg. 31**				
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
Sl No.	**1.1.1 Appointments**				**This Guidelines**
1	**Appointment of the Architect**	Yes	No	NA	4
1.1	If yes, Name				
1.2	Date of appointment				
2	**Appointment of MEP Consultant**	Yes	No	NA	
2.1	If yes, Name				
2.2	Date of appointment				
3	**Name of Electrical Consultant**	Yes	No	NA	
3.1	Contact Details				
4	**Appointment of Electrical Contractor 1***	Yes	No		
4.1	If yes, Name				
4.2	Contact details				
4.3	Date of appointment				
4.4	License No.		Validity		
4.5	Agreement and Undertaking	*see* Form 1	Yes	No	
4.6	Name of Supervisor(s) -1				
4.6.1	Permit No.				
4.7	Name of Supervisor(s) -2				
4.7.1	Permit No.				
	* for subsequent change(s) in Electrical Contractor repeat 4 below				
4A	**Re-appointment of Electrical Contractor 1***		Yes	No	
4.1	If yes, Name				
4.2	Contact details				
4.3	Date of appointment				
4.4	License No.		Validity		
4.5	Agreement and Undertaking	*see* Form 1	Yes	No	
4.6	Name of Supervisor(s) -1				
4.6.1	Permit No.				
4.7	Name of Supervisor(s) -2				
4.7.1	Permit No.				
4B	**Re-appointment of Electrical Contractor 2***		Yes	No	

	Repeat 4.1 through 4.5.4, when applicable		
Signatures of stakeholders	Architect	MEP Consultant	Electrical Consultant
	Electrical Contractor	Developer/PMC	Owner

ANNEX B
(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK
(*Clause* 5.1)

Check List No. 2					
Design Part 1 - Planning					
Ref.	**Reg. 14, 60, 62, 65, 67, NEC-Part 1/Section 7/4.2, IS 732-4.1.4, 4.1.3.1.2, 4.1.3.12**				
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
Sl No.	**1.1.2 Land/Site survey**				**Guidelines**
1	Does the electrical overhead line exist on site?	Yes	No		5.1 5.4
1.1	If yes mention voltage level		kV		
1.2	Did you check with power utility or concerned if UG line exists within plot	Yes	No		
1.3	If UG line exists mention voltage level		kV		
1.4	If UG or OH line exists did you check compliance with CEA Reg. 63.	Yes	No	NA	
	1.1.2.2 Construction activities				
2	From the location of existing electrical overhead or underground line, will there be:				5
2.1	Blasting within 300 m	Yes	No		
2.2	Cutting of soil within 10 m	Yes	No		
2.3	Brick kiln, or any polluting unit within 500 m	Yes	No		
2.4	If yes, did you check compliance with CEA Reg. 65	Yes	No	NA	
	1.1.3 Electrical load, supply (primary assessment)				
3	Assessment of electrical load				6
3.1	Assessment done?	Yes	No		
3.2	If yes, anticipated capacity		kVA/ kW		
3.3	Power from utility provider				
3.4	Electrical supply	HT	LT		
3.5	Power from standby supply		kVA/ kW		
3.6	Gen-Set		kVA	NA	
3.7	UPS		kVA	NA	
2	**1.2 Assessment of Required Electrical Equipment and System and Architectural Planning**				
2.1	DSS required?	Yes	No		6
2.1.1	Required space, location considered?	Yes	No	NA	
2.2	Gen-set required?	Yes	No	NA	
2.2.2	Required space, location considered?	Yes	No	NA	
2.3	Distribution cables	Yes	No	NA	
2.3.1	Marking of routes in plot?	Yes	No	NA	

2.3.2	Separate cable shaft in building?	Yes	No	NA	
2.4	Rooms	Yes	No	NA	
2.4.1	Approved design meter room(s)	Yes	No	NA	
2.4.2	Control rooms and if other specify	Yes	No	NA	

Signatures of stakeholders	Architect	Electrical Consultant	Electrical Contractor

ANNEX C
(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WOR004B
(*Table* 1)

Check List No. 3					
Design Part 2 - Electrical Installation					
Ref.	**Reg. 14, 37, 38, 44; IS 732-4.2 ,3 ,4; NEC Part 1/Sections-9, 10, 11, 12**				
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
2.1	**Internal Electrical Installation**				**Guidelines**
1	Drawings Showing Layouts of Internal E.I.				
1.1	Compliance - Light and fan points	Yes	No	NA	6
1.2	Compliance - Power outlets 6A, 16A	Yes	No	NA	
1.3	Compliance - Switchboards	Yes	No	NA	
1.4	Does drawing provide all details?	Yes	No	NA	
2	Electrical Distribution - Cables/Wires				
2.1	Compliance - Division of circuits	Yes	No	NA	
2.2	Compliance - Type of cable	Yes	No	NA	
2.3	Compliance - Current carrying capacity as per situation	Yes	No	NA	
2.4	Compliance - Derating factors	Yes	No	NA	
2.5	Compliance - Cross-sectional area calculation	Yes	No	NA	
2.6	Cable schedule with specifications prepared?	Yes	No	NA	
3	Electrical Distribution - Cable/Wire Enclosures and Management				
3.1	Compliance - Conduit, trunking type and size, fill factor, etc	Yes	No	NA	
3.2	Compliance - Cable management	Yes	No	NA	
3.3	Specification sheet with drawing prepared?	Yes	No	NA	
4	Electrical Distribution - DBs, Panels				
4.1	Compliance - Distribution boards type	Yes	No	NA	
4.2	Compliance - Panel boards	Yes	No	NA	
4.3	Compliance - Protections	Yes	No	NA	
4.3.1	Electric shock	Yes	No	NA	
4.3.2	Thermal effects	Yes	No	NA	
4.3.3	Over-Current	Yes	No	NA	
4.3.4	Voltage disturbance, EMI	Yes	No	NA	
4.4	Specifications prepared?	Yes	No	NA	
5	Electrical Distribution - SLD				
5.1	compliance - SLD with all details	Yes	No	NA	
6	Electrical Distrubution - Layouts				

6.1		Compliance - Location and access of DBs and panels	Yes	No	NA	
6.2		Compliance - Routing of distribution network	Yes	No	NA	
6.3		Compliance - Safety clearances from other services	Yes	No	NA	
6.4		Drawing with all details prepared?	Yes	No	NA	
7	Specifications for Fittings/Fixtures					
7.1		Compliance - Illumination standards for lighting fixtures	Yes	No	NA	
7.2		Compliance - Ceiling fans, locations, clearances	Yes	No	NA	
7.3		Compliance - Exhaust fans, air circulation	Yes	No	NA	
7.4		Drawings and specifications with details prepared?	Yes	No	NA	
Signatures of stakeholders	Architect	Electrical Consultant	Electrical Contractor			

ANNEX D

(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK

(*Table* 1)

Check List No. 4					
Design Part 3 - Special Locations, Safety Service and Energy Efficiency					
Ref.	**Reg. 14, 37, 38, 44; IS 732-4.2 ,3 ,4; NEC Part 1/Sections-9, 10, 11, 12**				
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
Sl No.	**Type of additional requirements**				**Guidelines**
1	High-Rise Buildings (height above 15m)	Yes	No		
1.1	Does building come under the purview of Electrical Inspector?	Yes	No	NA	6.1.2
1.2	Compliance with CEA Reg. 38 (3) (i), read NEC P3S22 **7.3.12**	Yes	No	NA	
1.3	Compliance with CEA Reg. 38 (3) (ii)	Yes	No	NA	
1.4	Compliance with NEC P3 S22	Yes	No	NA	
2	Hospitals and Medical Locations (compliance with IS 17512)	Yes	No	NA	9
3	Hotels (compliance with NEC P3 S20)	Yes	No	NA	9
4	Places of Public Assembly, Gathering (Compliance with NEC P3 S10, 13)	Yes	No	NA	9
4.1	Compliance with Sec. 54 of The Electricity Act, 2003	Yes	No	NA	6.1.2
5	Street, Path, Garden, Flood Lighting (compliance with NEC P5)	Yes	No	NA	9
5.1	Compliance with Illumination Standards	Yes	No	NA	
6	Compliance of Safety Services	Yes	No	NA	8
7	Compliance to Energy Efficiency Requirements	Yes	No	NA	10

Signatures of stakeholders	Architect	Electrical Consultant	Electrical Contractor

ANNEX E

(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK

(*Table* 1)

Check List No. 5					
Design Part 4 - Material Selection					
Ref.	**Reg. 12, 35, 36, 42; IS 732-4.2 ,3 ,4; NEC Part 1/Sections-9, 10, 11, 12**				
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
1	**3.1 Selection of Type of Wiring**				**Guidelines**
1.1	Factors of external influences considered?	Yes	No		7
1.2	Is method of construction suitable to situation?	Yes	No		
2	**3.2 Material Selection and Specifications**				
2.1	Switch-boards and accessories				7
2.1.1	Compliance - as per specifications	Yes	No	NA	
2.1.2	Compliance - ISI/international standard	Yes	No	NA	
2.2	Wires, cables				
2.2.1	Compliance - as per specifications	Yes	No	NA	
2.2.2	Compliance - ISI/international standard	Yes	No	NA	
2.3	Wiring Enclosures - conduits, trunkings				
2.3.1	Compliance - as per specifications	Yes	No	NA	
2.3.2	Compliance - ISI/international standard	Yes	No	NA	
2.4	Cable Management - trays, ladders, etc and accessories				
2.4.1	Compliance - as per specifications	Yes	No	NA	
2.4.2	Compliance - ISI/international standard	Yes	No	NA	
2.5	Bub-bar trunking				
2.5.1	Compliance - as per specifications	Yes	No	NA	
2.5.2	Compliance - ISI/International Standard	Yes	No	NA	
2.6	Distribution boards and panels				
2.6.1	Compliance - as per specifications	Yes	No	NA	
2.6.2	Compliance - ISI/International Standard	Yes	No	NA	
2.7	Protections				

2.7.1	Compliance - as per specifications	Yes	No	NA	
2.7.2	Compliance - ISI/ International Standard	Yes	No	NA	
2.8	Fittings and fixtures				
2.8.1	Compliance - as per specifications	Yes	No	NA	
2.8.2	Compliance - ISI/ International Standard	Yes	No	NA	
2.9	Record of makes/brands/manufacturer's test certificate				
2.9.1	List of all material showing make and brand prepared?	Yes	No		
2.9.2	Record of test certificates of material maintained?	Yes	No	NA	
Signatures of stakeholders	Electrical Consultant		Electrical Contractor		

ANNEX F

(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK

(*Table* 1)

Check List No. 6					
Design Part 5 - Supply Source					
Ref.					
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
1	**4.1 Design Load - Detailed Load Assessment**				**Guidelines**
1.1	Preparation of detailed load assessment sheet for record				
1.1.1	In respect of every consumer	Yes	No	NA	
1.1.2	In respect of group of consumers within complex	Yes	No	NA	
2	**4.1 LT Supply**				
2.1	Does meter room comply	Yes	No	NA	
2.2	Earthing system				6.3.2
2.2.1	State type of system considered - TNS/TNCS/TT/IT				6.3.2
2.2.2	Will a consumer have separate earth electrode/earthed terminal?	Yes	No	NA	6.3.2
2.2.3	Protective equipotential bonding considered?	Yes	No	NA	7.4
2.3	Supplier's side				
2.3.1	Provisions to install service cable and equipment done?	Yes	No	NA	
2.3.2	Provision of supplier's earth terminal considered?	Yes	No	NA	
2.3.3	Provision to protect supplier's installation taken?	Yes	No	NA	
2.4	Consumer's side				
2.4.1	Switch-fuse/Circuit breaker at point of supply	Yes	No		

2.4.2	Compliance - mains and its route up to main DB	Yes	No	NA
2.5	Standby supply - Gen-set			
2.5.1	Preparation of capacity design sheet for record	Yes	No	NA
2.5.2	Compliance - location, panel, cable work	Yes	No	NA
2.6	Standby supply - Battery backup UPS/Inverter			
2.6.1	Preparation of capacity design sheet and keeping record	Yes	No	NA
3	**4.2 HT supply of Consumer/DSS of Supplier**			
3.1	Provisions for installation			
3.1.1	Compliance - location, space and civil infrastructure			
3.1.2	Compliance – Transformer	Yes	No	NA
3.1.3	Compliance – Equipment	Yes	No	NA
3.1.4	Compliance – Metering	Yes	No	NA

Signatures of stakeholders	Architect	Electrical Consultant	Electrical Contractor

ANNEX G

(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK

(*Table* 1)

Check List No. 7					
Design Part 6 - Earthing, Lightning Protection					
Ref.	**IS 732, IS/IEC 62305**				
Name of Project/Work					
Site Address					
Name of Owner/Developer					
Contact details					
1	**x.x Earthing**				**Guidelines**
1.1	Type of system earthing				6.3.2
1.2	Main protective equipotential bonding	Yes	No	NA	7.5
1.3	Supplementary equipotential bonding	Yes	No	NA	7.5
1.4	Fault loop impedance of all circuits	Yes	No	NA	6.3.2 (e)
1.5	Functional earthing requirements considered	Yes	No	NA	7.6
1.6	Earth electrodes	Yes	No	NA	7.7
2	**x.x Lightning Protection System**				
2.1	Risk assesment carried out	Yes	No	NA	6.7.1(b)
2.2	LPS required or not	Yes	No		
2.3	Class of LPS (1 to 4 based on lightning protection level)				
2.4	Type of air termination				
2.5	No of down conductors and routing				
2.6	No of down conductors routed through shafts				
2.7	Soil resistivity				
2.8	Type of earthing	Type A	Type B		
2.9	If type A, number of earth rods and its length				
2. 10	Incoming service is HV or LV	HV	LV	None	
2.11	Number of low voltage incoming service lines				
2.12	Type and rating of each set of SPD at incoming service lines				

Signatures of stakeholders	Architect	Electrical Consultant	Electrical Contractor

ANNEX H

(*Informative*)

STANDARD PROCEDURES FOR EXECUTING ELECTRICAL WORK

(*Clause* 11, 11.3, 13)

Check List No. 8	
Verification (Inspection and Testing of Installations)	
Ref.	**6** of IS 732, **4.2** and **4.3** of NEC Part 1 Section 17, IS 732 and IEC 61936-1
	Reg No. 32, 33, 34 and 48 of CEA measures relating to safety and electric supply regulations, 2023
Name of Project/Work	
Site Address	
Name of Owner/Developer	
Contact details	
Name of Safety Inspector	
Contact details	

1	**Inspection and Testing of HV Installation**			**Guidelines**
1.1	Inspection completed as per **4.2.1** of NEC part 1, section 17	Yes	No	11.1
1.2	Testing completed as per **4.3.1** of NEC part 1, section 17	Yes	No	
1.3	Number of defects reported during inspection			
1.4	Number of defects rectified			
1.5	Number of defects which could not be rectified			
1.6	Detailed report provided on non rectifiable defects provided to client	Yes	No	
1.7	Next periodic verification of HV system (in years)			
2	**Inspection and Testing of LV System: (*see* 6 of IS 732)**			
2.1	Inspection completed and the forms in Annexure QQ and RR of IS 732 submitted fulfilling the requirements of Annex MM	Yes	No	11.4
2.2	Number of defects reported during inspection			
2.3	Number of defects rectified (reported during inspection)			
2.4	Number of defects which could not be rectified (reported during inspection)			
2.5	Testing completed and the forms in Annexure SS of IS 732-6 submitted	Yes	No	11.6
2.6	Number of defects reported during testing			
2.7	Number of defects rectified (reported during testing)			

2.8	Number of defects which could not be rectified (reported during testing)			
2.9	Detailed report provided on non rectifiable defects provided to client	Yes	No	
2.10	Next periodic verification of LV system (in years)			11.3
	NOTE — An installation with defects are unsafe to operate.			

Signatures of stakeholders	Chartered Electrical Safety Engineer	Electrical Consultant
	Electrical Contractor	Architect

ANNEX J

(*Informative*)

GUIDANCE ON SELECTION OF ELECTRICAL REQUIREMENT OF BUILDINGS BASED ON CONDITIONS OF EVACUATION AS PER TABLE 7 OF IS 732 AND TYPE OF BUILDING OCCUPANCY

(*Clause* 5.5, 7.3.2)

Category	**Occupancy Type as Per NBC of India : 2016 (For Detailed Description, Refer NBC: Part 4, Fire and Life Safety, Table 7)**	**Height of Building (H) In Meters/Category**	
Group A	Residential	< 15 (h)	> 15 (h)
A1, A2	Lodging and rooming houses, One- or two- private dwelling	BD1	NA
A3, A4	Dormitories, Apartment Houses	BD1	BD2
A5	Hotels	BD2	BD4
A6	Starred hotels	BD4	
Group B	Educational	< 15 (h)	> 15 (h)
B1, B2	Schools, all other/training institutions	BD3	BD4
Group C	Institutional	< 10 (h)	> 10 (h)
C1	Hospitals and sanatoria (IPD/OPD)	BA3, BD3	
C2	Custodial institutions	BD1	BD2
C3	Penal and mental institutions	BA3, BD2	
Group D	Assembly	< 10 (h)	> 10 (h)
D1 to D6	Theatre/Cinema, accommodation, temporary and other structures, mixed-assembly and mercantile	BD3	BD4
D7	UG/elevated mass rapid transit system	BD4	
Group E	Business	< 10 (h)	> 10 (h)
E1 to E5	Offices, laboratories, clinics, libraries, IT parks, telephone exchange, broadcasting and TV stations	BD3	BD4
Group F	Mercantile	< 15 (h)	> 15 (h)
F1, F2	Shops, stores	BD3	BD4
F3	UG shopping centers and service centers in same building	BD4	
Group G	Industrial		
G1	Low hazard	BD2	
G2	Moderate hazard	BE2, BD2	
G3	High hazard	BE2, BE3, BD2	
Group H	Storage, for example warehouses, cold storages, truck and marine terminals	BE1, BE2, BD2	
Group J	Hazardous	BE3, BE4, BD2	

NOTES

1 Wiring requirements with respect to building classification refer IS 732.

2 The above categorization is to guide users for easy selection of classification of building as per IS 732 in line with the requirements of NBC.

3 In case of confusion, the next higher difficult zone shall be considered.

ANNEX K

(*Informative*)

RECOMMENDED MAXIMUM INTERVALS BETWEEN PERIODIC VERIFICATION (IN YEARS)

(*Clause* 5.2, 11.2)

Category	**Occupancy Type as per NBC of India : 2016 (For Detailed Description, Refer NBC: Part 4, Fire and Life Safety, Table 7)**	**Frequency of Periodic Verification in Years (Y) Based on Height (H) in Meters of Buildings**	
Group	Residential	<15 (h)	>15 (h)
A1, A2	Lodging and rooming houses, One- or two- private	10 (y)	NA
A3, A4	Dormitories, Apartment houses	10 (y)	5 (y)
A5	Hotels	5 (y)	3 (y)
A6	Starred hotels	2 (y)	
Group B	Educational	<15 (h)	>15 (h)
B1, B2	Schools, all other/training institutions	3 (y)	2 (y)
Group C	Institutional	<10 (h)	>10 (h)
C1	Hospitals and sanatoria (IPD/OPD)	2 (y)	
C2	Custodial institutions	5 (y)	3 (y)
C3	Penal and mental institutions	3 (y)	
Group D	Assembly	<10 (h)	>10 (h)
D1 to D6	Theatre/Cinema, accommodation, temporary and other structures, mixed-assembly and mercantile	3 (y)	2 (y)
D7	UG/elevated mass rapid transit system	2 (y)	
Group E	Business	<10 (h)	> 10 (h)
E1 to E5	Offices, laboratories, clinics, libraries, IT parks, telephone exchange, broadcasting and TV stations	3 (y)	2 (y)
Group F	Mercantile	<15 (h)	>15 (h)
F1, F2	Shops, stores	3 (y)	2 (y)
F3	UG shopping centers and service centers in same building	2 (y)	
Group G	Industrial	Any height	
G1	Low hazard	5 (y)	
G2	Moderate hazard	3 (y)	
G3	High hazard	1 (y)	
Group H	Storage, for example, warehouses, cold storages, truck	1 (y)	
Group J	Hazardous	1 (y)	

ANNEX M

(*Informative*)

CHECKLIST FOR HANDING-OVER DOCUMENTS TO INDIVIDUAL BUYER

(Applicable as minimum documents required for the compliance of electrical requirements in a building as per *RERA* act, 2016)
(*Clause* 14)

Sl No.	**Document**	**✓ or X**
(1)	(2)	(3)
i)	Electrical service connection papers relating to individual energy meter–sanctioned/connected load, security deposit paid	
ii)	Copy of test report of the electrical installation	
iii)	Single line diagram of completed electrical installation	
iv)	Training for maintenance of the electrical installation	
v)	Instructions/Trouble shooting chart in respect with the use, limit of maximum load, operation, safety of electrical installation and precautions to be taken while making changes in existing installation	
vi)	Emergency contacts in respect with any possible problem with electrical installation	

Handed over **Taken over**

Promoter **Electrical Contractor** **Owner**

Date:

ANNEX N

(*Informative*)

CHECKLIST FOR HANDING-OVER DOCUMENTS TO SOCIETY/ASSOCIATION OF OWNERS

(Applicable as minimum documents required for the compliance of electrical requirements in a building as per *RERA act*, 2016)

Sl No.	**Document**	**✓ or X**
(1)	(2)	(3)
i)	Load sanctioned letter of electric supply company	
ii)	Copies of the payments made to supply company, towards proving supply	
iii)	Copy of agreement with supply company	
iv)	Electrical service connection papers in respect of common energy meters sanctioned/connected load, security deposit paid	
v)	Single line diagram from the tapping point of service cable to the point of supply (incoming terminal of consumers switch/MCB installed near energy meter)	
vi)	Copy of test report of the electrical installation	
vii)	Copies of the approvals/permissions/licenses received from the authorities in respect of; Generating set/s (CEA Reg. 32) High-rise building (CEA Reg. 36) HT installation (CEA Reg. 43); if installation is owned by consumer/s Lift/s	
viii)	Warranties/Guarantees and initial AMCs of lift/s, generating-set, UPS and batteries and also in respect of installation handed over to supply company etc as per applicable	
ix)	Instructions in respect of maintenance and operation of water pump, lift and handling emergency. Telephone numbers of emergency services	
x)	(1) List of liabilities, responsibilities to be undertaken: a) Maintaining electrical installation (related to common facilities like lights, water pump, fire-fighting equipment), in good condition so as to cause no danger; and b) Renewing AMCs in respect of generating set, lifts after defect liability period. Due dates shall be given. c) Safeguarding electrical installation belonging to supply company in the premises, for example, equipment in meter room; d) Communicating electrical inspector within 24 hours in respect of any electrical accident; and e) Any electrical related work to be got done only through license/permit holder person.	

Handed over		**Taken over**
Promoter	**Electrical Contractor**	**Secretary/Office bearer of Society/Association**
Date:		

ANNEX P

LIST OF REFFERED STANDARDS

a) CEA (*Measures relating to Safety and Electric Supply) Regulations*, 2010 (including further amendments to date).

b) Referred standards:

IS No./Other Publications	*Title*
IS 732 : 2019	Code of practice for electrical wiring installations (*fourth revision*)
IS 3043 : 2018	Code of practice for earthing (*second revision*)
IS 12032 (all parts)	Graphical symbols for diagrams in the field of electrotechnology
IS 17017 (Part 1) : 2018	Electric vehicle conductive charging system: Part 1 General requirements
IS 17121 : 2019	General requirements for arc fault detection devices
IS/IEC 62305 (all parts)	Protection against lightning
IS/IEC 60079 (Part 17) : 2013	Explosive atmospheres: Part 17 Electrical installations inspection and maintenance (*first revision*)
IS/IEC 61439	Power switch gear and control gear assemblies
(Part 2) : 2011	Part 2 Power switch gear and control gear assemblies
(Part 3) : 2012	Distribution boards intended to be operated by ordinary persons (Dbo)
IS/IEC 61557 (all parts)	Electrical safety in low voltage distribution systems up to 1 000 V a.c and 1 500 V d.c. — Equipment for testing, measuring or monitoring of protective measures
IEC 60364-5-55 : 2016	Electrical installations of buildings — Part 5-55: Selection and erection of electrical equipment — Other equipment
IEC 60445 : 2021	Basic and safety principles for man-machine interface, marking and identification — Identification of equipment terminals, conductor terminations and conductors
IEC 60670-24	Boxes and enclosures for electrical accessories for household and similar fixed electrical installations — Part 24: Particular requirements for enclosures for housing protective devices and other power dissipating electrical equipment
IEC 61082-1 : 2014	Preparation of documents used in electrotechnology — Part 1: Rules
IEC 61936-1 : 2021	Power installations exceeding 1 kV AC and 1 + 5 kV DC — Part 1: AC
IEC 61557 (all parts)	Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC — Equipment for testing measuring or monitoring of protective measures
IEC 62208 : 2011	Empty enclosures for low-voltage switchgear and controlgear assemblies — General requirements
IEC 81346-1 : 2022	Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 1: Basic rules
SP 7 : 2016	National building code of India, 2023
SP 30	National electrical code of India, 2023

IS No./Other Publications	*Title*
CEA Regulation	CEA (Measures relating to safety and electric supply) Regulations, 2023 (including further amendments to date).

ANNEX Q

(*Foreword*)

COMMITTEE COMPOSITION

Electrical Installations Sectional Committee, ETD 20

Organization	*Representative(s)*
In Personal Capacity (*90/14-B, Malviya Nagar New Delhi-110017*)	Shrimati Sumita Anand **(*Chairperson*)**
Areva T and D India Limited, Noida	Shri Saha Biswajit
Brihan Mumbai Electric Supply and Transport Undertaking, Mumbai	Shri H. V. Vagal Shri M. B. Bamble (*Alternate*)
BSES Rajdhani Power Limited	Shri Chander Kant Sood Shri Rajiv Sharma (*Alternate*)
Calcutta Electric Supply Corporation Limited, Kolkata	Shri Sujit Kumar Pathak Shri Bratin Banerjee (*Alternate*)
Central Electricity Authority, New Delhi	Shri Ashok Kumar Rajput Shri O. P. Suman (*Alternate*)
Central Public Works Department, New Delhi	Shri Chaitanya Kumar Verma
Delhi Metro Rail Corporation Limited, Delhi	Shri Anand Kumar Shri Manuj Singhal (*Alternate*)
Department of Telecommunications, Ministry of Communications and Information Technology, New Delhi	Shri Vinod Kumar Hirna Shri Saurabh Chaturvedi (*Alternate*)
Directorate General Factory Advice Service and Labour Institutes, Mumbai	Shri H. M. Bhandari Shri Amit Gola (*Alternate*)
Electrical Contractors Association of Maharashtra, Pune	Shri Sanjay Kolhatkar Shri Sunil Bhure (*Alternate*)
Electrical Installation Engineers' Welfare Association, Coimbatore, Tamil Nadu	Shri S. Manivannan Shri S. Gopalakrishnan (*Alternate*)
Engineers India Limited, New Delhi	Ms Shalini Verma Shri Rohit Kumar Singh (*Alternate*)
GETCO, Vadodara	Shri A. S. Shah Shri M. A. Prajapati (*Alternate*)
Garden Reach Shipbuilders and Engineers Limited, Kolkata	Shri Soumitra Bhaduri Shri T. K. Guha Roy (*Alternate*)
Government of Assam, Chief Electrical Inspector, Guwahati	Shri Nilamani Sarma
Government of Kerala, Chief Electrical Inspectorate, Thiruvananthapuram	Shri Anil Kumar V. C. Shri Sagar V. K. (*Alternate*)
Government of Madhya Pradesh, Chief Electrical Inspectorate, Sagar	Shri Mujalde S. S. Shri Dubey A. K. (*Alternate* I) Shri I. V. Chishi (*Alternate* II)
Government of Orissa, Chief Electrical Inspectorate, Bhubaneswar	Shri Santosh Das Shri Pyarimohan Mishra (*Alternate*)

Organization	*Representative(s)*
Government of Tamil Nadu, Chief Electrical Inspectorate, Chennai	Shri Thiru. T. Elambooranan B. E. Er P. Palani B. E. (*Alternate*)
Haryana Vidyut Prasaran Nigam Limited, Panchkula	Ms Aman
Havells India Limited, Noida	Shri Manoj Kumar Gupta Shri Rakesh Kaushik (*Alternate*)
Indian Electrical and Electronics Manufacturers Association, New Delhi	Shri S. Gopa Kumar Shri J Pande (*Alternate* I) Shri Uttam Kumar (*Alternate* II)
Indian Railways Centre for Advanced Maintenance Technology (CAMTECH), Gwalior	Shri Himanshu Maheswari
International Copper Association India, Mumbai	Shri Amol Kalsekar Shri Manas Kundu (*Alternate* I) Shri Debdas Goswami (*Alternate* II)
Jaipur Vidyut Vitaran Nigam Limited, Jaipur	Shri Arjun Singh
Legrand India Private Limited, Mumbai	Shri Suresh Deotalu Shri Rajkumar Panicker (*Alternat*e)
Mazagon Dock Limited, Mumbai	Shri Parag Patil Shri A. M. Joglekar (*Alternat*e)
Ministy of Defence, Bengaluru	Shri Girish Joshi
National Hydroelectric Power Corporation, Faridabad	Ms Manisha Srivastava Shri Surya Shankar Bharti (*Alternate*)
National Institute of Solar Energy, Gurugram	Shri Rajesh Kumar Shri Manoj Morampudi (*Alternate*)
NTPC Limited, New Delhi	Shri Ravish Chandra Jha
Nuclear Power Corporation of India Limited, Mumbai	Shri S. Pandariganthan Shri D. A. Bhaskar (*Alternate*)
Public Works Department, Government of Maharashtra, Mumbai	Shri Hemant M. Sali
Rural Electrification Corporation Limited, New Delhi	Shri Dastidar Shantanu Ghosh
Schneider Electric India Private Limited, Bengaluru	Shri Srinivas R Kulkarni Shri P. Suresh Raja (*Alternate* I) Shri C. S. Kore (*Alternate* II)
Siemens Limited, Mumbai	Shri Amitava Nayak Shri Deshpande Ashish (*Alternate*)
Tata Consulting Engineers Limited, Navi Mumbai	Shri G. V. Chandra Sekhar Shri Hrishikesh Acharya (*Alternate*)

Organization	*Representative(s)*
Tata Power Delhi Distribution Limited, New Delhi	SHRI KAPIL KUMAR
The Shipping Corporation of India, Mumbai	SHRI NITIN TAKPERE SHRI ABHISHEK KASHYAP (*Alternate*)
In Personal Capacity (*603 Peregrine, Rehejawoods, Kalyaninagar, Pune 411006*)	SHRI AMITABHA SARKAR
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SHRI RITWIK ANAND
SCIENTIST 'D'/JOINT DIRECTIR
(ELECTROTECHNICAL), BIS

(*Continued from second cover*)

The composition of the Committee, responsible for the formulation of this standard is given in Annex Q.

This standard is developed with a view to provide such requirements in measurable terms to be complied with starting from project planning, design of electrical system, selection of equipment, installation, commissioning and finally testing and ensure compliance. Compliance to this standard is expected to be beneficial to various implementing agencies like Municipalities, RERA, Inspection agencies and would work as a bridge between the builder/electrical contractor and the ultimate users to provide the confidence that the installation is safe for use. Requirements specified can be used for compliance verification and certification purpose. Specific guidance at some places are also given for compliance.

In this Standard, the following verbal forms are used:

a) ‘shall’ indicates a requirement;
b) ‘should’ indicates a recommendation;
c) ‘may’ indicates a permission; and
d) ‘can’ indicates a possibility or a capability.

Information marked as ‘NOTE’ is for guidance in understanding or clarifying the associated requirement.

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